(7) On the 14th morning, while loitering in the verandah, I was surprised at not being 'attacked' by the parents, who were sitting silently on the tree. I naturally suspected something unusual and, on checking the nest, found the nestling dead. As I tried to bring it down, the parents rushed to the verandah, protested for a while, and then became silent. A little later, they came to the nest, looked around silently, and then went away never to return, although they are still living around my house.

In conclusion, I cannot claim that I know the exact reasons for the nestling's death, but there is no doubt that there had been a lot of interference and the parents could not properly feed and look after it, which may well have caused its death. I have a feeling that the nesting would have been a success but for our presence in the house. On this assumption, I suggest that, although the House Crows are closely associated with human dwellings, they do not build in houses because they have not overcome the fear or shyness of actual human presence close to their nests or nesting site. This may well be a reason why they build high up in trees far beyond human interference. Other birds of similar habit, the House Sparrows for example, do not have such fear and can successfully complete their nesting in human dwellings. The failure on the part of the House Crows under discussion is, therefore, due to natural selection which does not seem to favour such sporadic and out of the way venture by them.

References:

Ali, S. 1955. *The Book of Indian Birds*. 5th edn.
Baker, E. C. S., 1922. *The Fauna of British India*. Birds, Vol. 1.
Fletcher, T. B. and Inglis, C. M., 1936. *Birds of an Indian Garden*. 2nd edn.
Whistler, H. (Revised by N. B. Kinnear) 1949 *Popular Handbook of Indian Birds*. 4th edn.

A peculiar mutant sunbird

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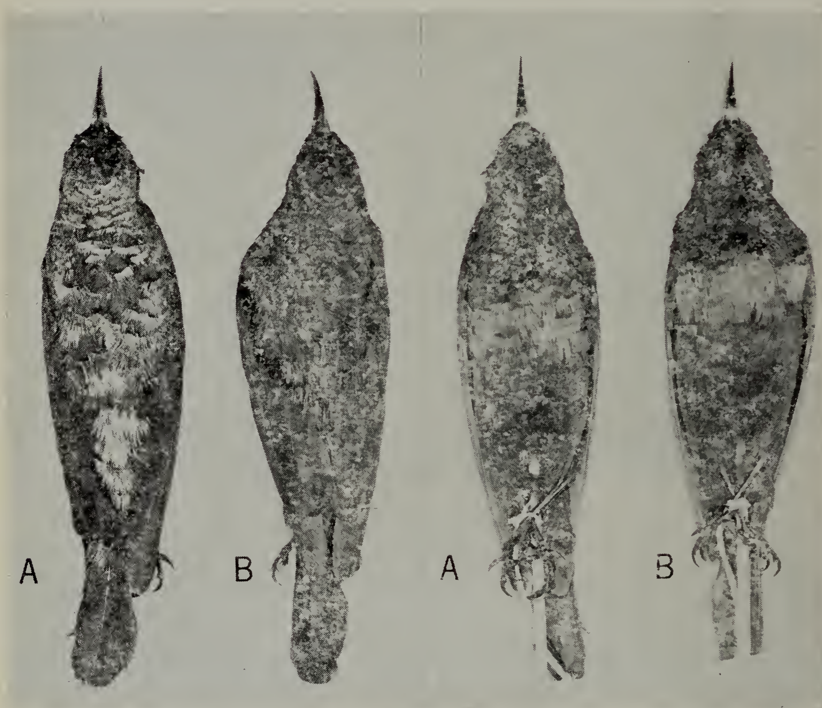
During October and November 1961 I had the opportunity of collecting in the Kalabo District of Barotseland, Northern Rhodesia. Here one of the most common sunbirds was the Marico Sunbird, *Nectarinia mariquensis* (Smith) and we succeeded in obtaining a series of 12 adult males. Among these was one from Sikongo that at first glance appeared to be completely melanistic. However, it is actually normal in pigment, but has the structural part of the feather so changed that there is no iridescent colour.

Normal *mariquensis* is iridescent green on the back, lesser and median coverts, head, and upper breast, with upper tail-coverts and a thin band on the breast shading to bluish-violet. Below the iridescent violet on the breast is a red breast band. Each feather of this band has a broad red tip with a narrow violet iridescent band below it. Belly, wings and tail are black.

The mutant male is wholly black with the exception of the red breast band which is normal in colour (see fig.). The areas, which in normally coloured birds are green, are glossy black, and the only sign of colour is on the upper tail-coverts and breast where there is a faint wash of purple. These are the areas that are iridescent bluish-violet normally. Since the red breast band, the only area which is dependent on pigment alone for colour, is normal, the black appearance of the mutant must be due to structural change.

One of the most recent, and certainly the most lucid, descriptions of the mechanism causing iridescence in birds is that of Greenewalt (1960). Although the detailed structure that he describes is that of hummingbirds (Trochilidae), the general principle of reflection and extinction of colours is equally valid for other families.

Iridescence is caused by the reflection of incident light from the front and back surface of a film of such thickness that the crests of the light



Dorsal (left) and ventral (right) views of a normal (A) and mutant (B) sunbird, *Nectarinia mariquensis*. The bright areas of the normal bird are iridescent green, but in the mutant bird these areas are glossy black. The red pectoral band, which depends on pigment alone, is unchanged in the mutant bird.

waves reflected from the rear surface reinforce the crests of the waves reflected from the front surface. Since the phase of light waves from the rear surface of the film is reversed, the film mnst be an odd number of quarter wave lengths (1/4, 3/4, 5/4, etc.) in optical thickness. Physical considerations show that the thickness of the reflecting film is 1/4 wave length in bird feathers, and this was demonstrated by Greenewalt in a remarkable series of electron microscope photographs of a hummingbird barbule. To continue the physical principle: when the thickness of the film approaches an even number of quarter wave lengths (0, 2/4, 4/4, etc.), the crests of the light waves reflected from the rear surface will coincide with the troughs reflected from the front surface, and the light will be cancelled out, the film appearing black.

In hummingbirds, the reflecting films appear as small, oval platelets about 2.5 microns long by 1 micron wide. These platelets are thickly clustered on the surface of the barbule giving the appearance of a tiled floor. In the gorget feathers of the hummingbird they are arranged in three layers intensifying the brilliant reflectance. The individual platelets are one-half wave length in optical thickness, but behave as two superimposed films of 1/4 wave length each to give the required reflectance. The exact structure in sunbirds has not been investigated in the same detail as in hummingbirds, but it must be essentially the same, for the same physical principles apply to both.

In the mutant sunbird from Kalabo, the gross appearance of the feathers, except for the lack of metallic green colour, is the same as in normal birds. A normal dorsal feather has the proximal two-thirds blackish and of a soft texture, and the distal third iridescent green with a hard shiny surface. A dorsal feather from the mutant bird is the same on the proximal two-thirds and has the same hard, shiny surface on the distal third, but is black instead of green. This surface similarity holds for all the feathers, including the red pectoral feathers which have a thin glossy band below the red pigment. Examination under an optical microscope at 430X reveals no apparent differences.

Since the surface structure of the feathers of the mutant bird is to all appearances normal, the difference must lie in the thickness of the reflecting platelets (assuming that the mechanism is the same as in hummingbirds). A doubling of the thickness of the platelet would result in the extinction of the reflected light, without in any way changing the surface appearance. A reduction in the thickness of the platelets to a small fraction of a wave length would accomplish the same thing. As these changes would be of the order of 0.15 to 0.25 microns, less than the wave length of visible light, they could not be observed by the most powerful optical microscope.

Although there is no direct evidence, the most probable cause of the black appearance of the sunbird from Sikongo is a mutation which has caused either a doubling or a great reduction in the thickness of the reflecting mechanism of the barbules. This would leave the surface appearance unchanged, while eliminating the green iridescence. Such a mutation would probably involve only a single locus of a chromosome. Although there is no reason to believe that this mutation should be less common than those producing albinism or melanism, this is the only record that I have found.

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References:

Greenewalt, C. H. 1960. *Hummingbirds*. Amer. Mus. Nat. Hist., New York, xxi + 250 p.p.